MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

ETM7146 - SWITCHING AND NETWORKING TECHNIQUES AND SYSTEMS

(All sections/Groups)

18 March 2017
2:30 P.M- 5:30 P.M.
(3 Hours)

INSTRUCTION TO STUDENT

1. This Question paper consists of 6 pages with 4 Questions only.

2. Attempt **All** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) The layering concept has been widely used in the design of network protocol stack.

(i) Discuss **TWO** benefits of the layering concept.

[2 marks]

(ii) Can layering be harmful? Justify your answer.

[3 marks]

(b) Consider the public switched telephone network and the Internet as example of circuit-switched and packet-switched networks, respectively.

(i) Discuss the key differences between the two type of networks.

[8 marks]

(ii) Someone suggested to run running web traffic over the circuit-switched network. Do you agree with the suggestion? Justify your answer.

[4 marks]

(c) The packet-switched based Internet offers best-effort service which does not provide quality of service for multimedia traffic. Discuss briefly **FOUR** techniques that are employed by existing multimedia applications (e.g. video streaming) to improve service delivery.

[8 marks]

Question 2

(a) Transmission Control Protocol (TCP) is widely used as the underlying transport for a wide range of applications, such as web services, email system and file transfer.

(i) Elaborate on what makes TCP an attractive choice for email system.

[2 marks]

(ii) Describe one type of application that may work poorly if TCP is being used as the underlying transport. Justify your answer.

[3 marks]

Continued...

(b) Figure Q2.1 depicts the format of a Transmission Control Protocol (TCP) packet header.

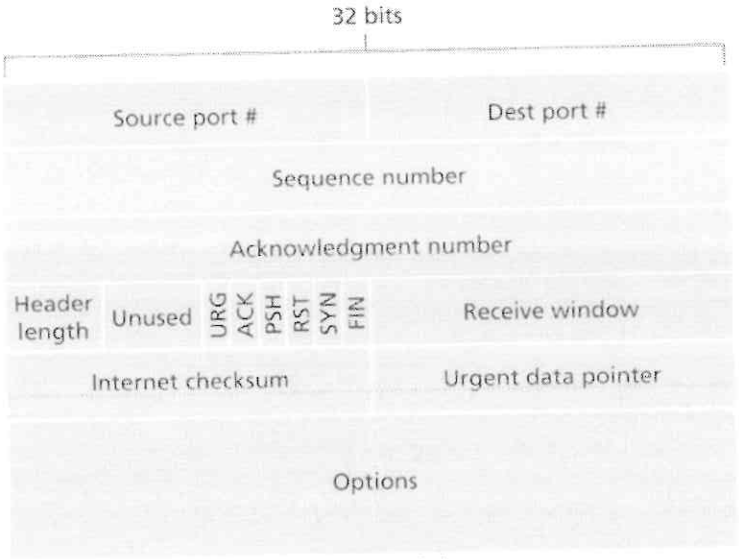

Figure Q2.1

(i) Identify the header fields used for TCP connection **setup** and **teardown** operations. [2 marks]

(ii) With the help of suitable diagrams, describe TCP connection setup and teardown operations. [5 marks]

(c) Consider a newly proposed transport layer protocol called X which has a message format as shown in Figure Q2.2.

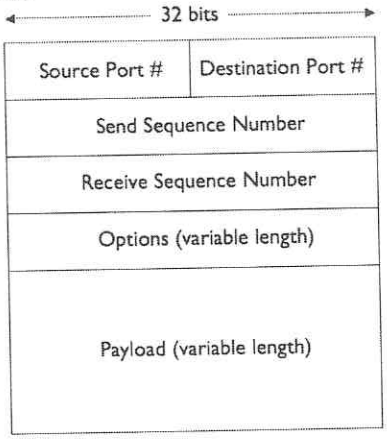

Figure Q2.2

(i) Discuss the kinds of service could be provided by X. Explain your answer. [6 marks]

Continued...

(c) (ii) Identify and discuss one potential disadvantage of the above header design.

[3 marks]

(d) (i) Describe TCP fast retransmit policy.

[1 mark]

(ii) Someone suggested to modify TCP fast retransmit policy such that a fast retransmit is triggered after the first duplicate acknowledgement for a segment is received.

Do you agree with the above changes to TCP fast retransmit policy? Explain your answer.

[3 marks]

Question 3

(a) Consider two hosts, A and B both located at the same Local Area Network (LAN) segment. Suppose A wishes to communicate with B, but it pocesses only B's IP address.

Describe how the Address Resolution Protocol (ARP) is able to provide IP address to Medium Access Control (MAC) address mapping for the above.

[5 marks]

(b) Figure Q3.1 depicts the format of an IPv6 packet. Several changes were made when transition from IPv4 to IPv6, notably the following.

- New fields such as traffic class and flow label are introduced, and
- Fields such as identifier, flags, fragmentation offset, option, header checksum, type of service and header length are removed.

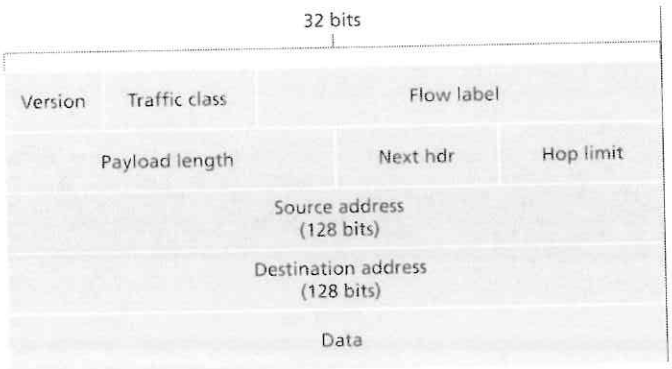

Figure Q3.1

(i) Why was the option field removed? Explain how optional information can be added to an IPv6 packet?

[2 marks]

Continued...

(b) (ii) Discuss the impacts and consequences of removing the identifier, flags and fragmentation offset fields.

[3 marks]

(iii) Will the removal of the header checksum reduce the reliability of IP datagram delivery? Discuss you answer.

[3 marks]

(c) Compare the working of hubs, LAN switches and routers for each of the following:

- Traffic isolation
- Plug-and-play
- Optimal routing
- Cut-through routing

[12 marks]

Question 4

(a) Figure Q4.1 shows a sample output of the `traceroute` program. Explain how the program is able to determine the route from the source to the destination.

[5 marks]

```
$ traceroute www.mmu.edu.my
traceroute to www.mmu.edu.my (45.64.168.84), 64 hops max, 52 byte packets
 1  10.55.36.118 (10.55.36.118)  46.737 ms
    10.55.32.74 (10.55.32.74)  7.175 ms  7.145 ms
 2  ipserverone-2.myix.gov.my (218.100.44.111)  8.190 ms  7.493 ms  7.731 ms
 3  103.10.156.74 (103.10.156.74)  8.669 ms  6.227 ms  7.874 ms
 4  45.64.168.84 (45.64.168.84)  8.165 ms  7.108 ms  7.731 ms
```

Figure Q4.1

(b) The distance vector routing algorithm is based on the distributed version of the Bellman-Ford shortest path algorithm.

(i) Consider the topology shown in Figure Q4.2. Suppose that each node initially knows the cost to each of its neighbours. Use the distance vector routing algorithm to derive the converged routing tables at the nodes. Show the routing table at each step of your working.

[6 marks]

Continued...

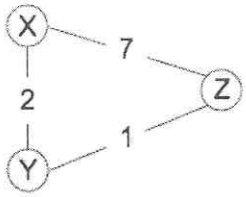

Figure Q4.2

(ii) Consider the topology shown in Figure Q4.3. Focus on nodes Y and Z distance table entries to destination X. Discuss the problem that will arise if the cost of link (X,Y) changes from 4 to 60.

[4 marks]

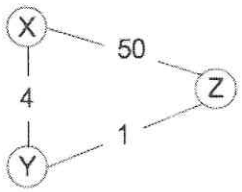

Figure Q4.3

(iii) Discuss two possible solutions for the problem in part (ii).

[4 marks]

(iv) The link state algorithm is another popular routing algorithm. Describe the differences between the algorithms in terms of communications between the nodes and the route computation process.

[6 marks]

End of Paper